Browntail Moth Project (BTM) Report-1991-1992
National Park Service
Cape Cod National Seashore

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March 30, 1992

Browntail moths, Euproctis chrysorrhoea were introduced to the Boston area and spread to Cape Cod. The numbers of browntail moths increased dramatically, and Cape Cod National Seashore took the initiative to cut and burn the winter webs in hopes to mitigate the number of larvea pupating during the summer season. Besides being a non-native species, the larvea and moths can give a itchy rash to people, similar to that experienced when humans come in contact with poison ivy. Some initial studies have been completed to document the browntail moths abundance and life cycle on Cape Cod National Seashore. These studies including the history of the introduction and spread of the browntail moth to Cape Cod, is available within the Resource Management files at Cape Cod National Seashore (CCNS). In November, 1991 the North Atlantic Regional Office funded a long-term study to ecological monitor the distribution and abundance of browntail moths on Cape Cod National Seashore. Most of the details of establishing the permanent quadrats and the operational sampling scheme have been worked out by the Invertebrate Ecologist, Howard Ginsberg, and the Cape Cod National Seashore Resource Management Staff. The field survey design and field work was performed by Cape Cod National Seashore's biological technician, Janice Minushkin. As of 3/12/92 the browntail moth project was deferred. This report summarizes the BTM project to date, in hopes that it will facilitate the implementation of the project in the future.

The ten BTM study transects were plotted on United States Geological Survey Maps. Each of the ten transects has been surveyed for vegetation types and numbers of browntail moth webs along its length. This information has been recorded in field notebooks and in word perfect files. A schedule of tasks to be completed by month, for the project was entered into a word perfect file. The survey markers were stored in the warehouse near the biological laboratory along with the other equipement purchased for the project. It was planned to construct 100 quadrats of which 18 quadrats have been placed in the field. For the established quadrats, the vegetation survey and the browntail moth web counts have been recorded on spreadsheets and typed into spreadsheet files (using quattro pro) in a similar format. The quadrats are listed in a database along with information including transect code, quadrat code, habitat, date, presence of webs and comments. This database should prove to be useful when the browntail moth project resumes. In addition a transect database (which includes information about the length, habitats, declination, and date surveyed), a common plant species database, and a equipement purchase order database is available. All of the information refered to above is stored on diskette found in the pocket of this binder and the hard copies are available within this report.

The following sampling program is based on the revised Operational Sampling Scheme dated January 14, 1992 and field work by Biological Technician, Janice Minushkin, that ended on March 12, 1992, and has been applied only to NPS land on the Cape Cod for the 1991-1992 season. Private lands may be included in subsequent years. For more information see the original memorandums, field summary notes, and quadrat information enclosed in this binder.

Operational Sampling Scheme

1. Samples were taken along transects placed every 4km from the tip of Cape Cod (near Herring Cove Beach) to the area of Coast Guard Beach; a total of 10 transects.

2. Transects were placed on U.S.G.S. topographic maps by drawing a line on a map along the center of the Cape (halfway between the Bay and Ocean shores). Each transect goes through a point 4km along this central line from the previous transect. The transect is the shortest line between the Bay and Ocean shores that passes through the 4km point.

3.'Appropriate habitat' for browntail moth (patches of woody and/or shrubby vegetation) was delineated along each transect using surveying techniques. The definition of 'appropriate habitat' was based the presence of browntail moth found in plant species as noted in various studies found at CCNS Resource Management files, including; mixed pine, oak forest/ oak forest/ pine, scrub oak, bayberry/ Rose species/ beach plum, scrub oak, bayberry/ and locust forest habitats. Only appropriate habitat along each transect was included in the sampling scheme. The length of each transect was walked recording vegetation types along the transect, any clusters of webs along the transect that are not within sample quadrats were noted.

4. Permanent quadrats measuring 10m x 10m were placed randomly (using a random number table) in appropriate habitat along each transect. Initially, a total of 10 quadrats ~~will~~ should be placed on each transect. Each quadrat ~~will~~ should straddle the transect line, 5m on each side. Each quadrat ~~will~~ have been marked at two standard points and landmarks ~~will~~ were ~~be~~ noted so the same quadrats can be found for future samples.

a. Twenty-five points, arranged as a 5 x 5 grid with 2m between points (1m from each edge of the quadrat), were placed in each quadrat. This was accomplished by marking points along two perpendicular edges of the quadrat at the following distances from the corner: 1m, 3m, 5m, 7m, 9m. The investigator found each of the 25 sampling points by sighting along two edge points, and recorded the following information for each of the 25 sampling points in each quadrat.

1. The plant or plants nearest each sampling point. If the same plant, or the same patch of plant covered more than one sampling point, it was recorded. This sampling was method applied to shrubs and trees. Each point can be considered the center of a 2m x 2m subquadrat.

2. The number of webs on the plant or trees was recorded. Each subquadrat was labelled A-1, A-2,...A-5, B-1...E-5 to give 25 points. Each plant was identified with a species code (e.g., PM for Prunus maritima). If a vegetation patch covered more than one sampling point it was drawn on the spreadsheet showing its coverage.

3. The total number of webs for the quadrat was recorded on the spreadsheet. A number was also noted for number of webs in a vegetation patch using the subquadrat label and it was noted if these are new or old webs.

5. Laboratory Techniques

The precise lab techniques were not worked out completely. Otis Air Force lab has been working with browntail moths, it may be worthwhile to get in touch with these folks for more information. The techniques for handling Euproctis chrysorrhoea will be developed (protective clothing, details of manipulation in the field and lab). It was suggested to put winter webs in ziplock bags. A pipet a solution of 5% KOH could be added to dissolve the web so the larvea could then be counted and measured while limiting possible human skin contact with E. chrysorrhoea. The webs could be kept in the freezer, and thawed later for laboratory analysis. Winter webs will be collected from each quadrat (one web from each of one or two selected plant species). The webs will be collected at random (e.g., the web closest to a random point in the quadrat), and will be returned to the lab for examination. The number of larvae per web, average larval lengths (or weights), and percent of larvae that are healthy (vs. parasitized) will be recorded, if possible.

A. Some of the lab equipment needed

1. Tyvex suit
2. mask
3. hand clippers
4. field bag
5. KOH
6. laboratory bench with hood
7. ziplock bags or Nasco whir-pak

6. Tree Canopy Cover

During the summer following the winter samples, tree canopy cover data should be collected from the permanent quadrats using the techniques given above using a plumb line to sight up into the canopy. Also, plant damage data (using transparency of canopy) can be collected from the permanent quadrats and correlated with winter web densities. Finally, pheromone trap data can be compared with web densities the previous and subsequent winters, and with plant damage data.

Methods used for field work from 12/20/92 -3/12/92:

1. Construction of PVC survey markers and rebar markers

A. Equipement-

a. The 2' PVC pipe was purchased in 10ft. lengths which was cut to 20" pieces.

b. The brass T shaped survey markers were engraved using a die kit (available at CCNS maintenance south district) with transect code and quadrat number.

c. saccrete sand mix was purchased in 80 lb. bags and was mixed with water as it was needed.

d. extra yellow engraved perma markers were used to identify the PVC marker with the National Park Service (NPS) and the browntail moth (BTM) project.

e. 3/4" rebar was purchased in 20ft. lengths and cut to 8" length to serve as deadmen for the PVC pipe.

f. 1/2" rebar was purchased in 20ft. lengths and cut to 18" lengths.

g. yellow rustolium spray paint 3 cans was used to paint 1/2" rebar

2. Assembly of Survey Markers

The materials were all cut to the proper length at the south district maintenance facility, CCNS. After the PVC was cut a drill press was used to bore holes 2" from the bottom so that a small length 8" rebar could be placed through the pipe. A shallow trough was used to mix the saccrete. The saccrete was fed into the PVC pipe ~~with~~ using a trowl and a funnel. The PVC pipes stood upright on a wooden board that was oiled to prevent the saccrete from sticking to the board. The pipe filled with saccrete was left to set approximately 20 minutes before the brass marker and yellow engraved perma marker were placed into the top of the PVC pipe. Once the entire survey marker was assembled it was left to dry over night. The 1/2" rebar was cut with an electric band saw at south district maintenance facility, CCNS. The rebar was then spread out on a canvas and spray-painted with floresent yellow rustolium paint to slow the oxidation of the rebar as well as

facilitate the relocation of the rebar in the field. The rebar was capped with yellow perma markers engraved NPS/BTM in the field to identify the quadrat with the browntail moth study.

3. List of field equipement used to set up permanent quadrats

1. Silva compass type 15T, The Ranger- 360 degrees delineated
2. United States Geological Survey Topographic Maps 1:25,000 scale from aerial photos taken in 1972, with transects delineated.
3. BTM field notebooks (1 and 2) rite-in-the-rain
4. field markers- PVC with brass engraved marker and metal rebar with yellow engraved perma marker cap
5. vegetation survey spreadsheets
6. pencils and ruler
7. park radio
8. camera- film, batteries
9. random numbers generated for each transect
10. surveyers ribbon
11. shovel, hammer
12. two backpacks with frame- the Army/Navy type (borrowed from south district rangers, CCNS)
13. two fiberglass tapes- 30m and 100m tapes
14. field notebook for new notes

4. Step-by-step directions for setting up the quadrats

a. The random numbers were generated using a Hewlett-Packard calculator. The numbers were used to represent a distance along the transect (i.e. a generated number of 20 would represent 20-30m from the zero point) where the quadrat would be located, the distance was measured placed on the topo map to be used as a reference in the field. Either the bay or the ocean was chosen as an arbitrary zero point as a reference (see random number sheets in this binder). Only distances on the transect with appropriate habitat for browntail moths were considered for possible quadrat locations.

b. The distance from the zero point to the quadrat on the topo map was found in the field by *pacing using a compass (set at the bearing the transect makes with the true north, the compass must be set to take into account the difference of approximately 16 degrees, due the magnetic variation) from a known distance along the transect. * To establish your pacing set out a 100m tape on the ground, walk along it counting your steps. Find your average for walking 20m this will be your pacing (i.e. in my case 13 steps = 20 meters).

c. When the location for the quadrat was found a survey flag was placed in the ground. From the point were the transect met the quadrat location (now marked with a survey flag) the compass bearing was oriented 90 degrees to the transect (transect angle + 90 degrees) and a 30m tape was used to measure 5m in either direction (so that you straddle the transect) and the rebar was hammered in place at the northeast corner and then capped with a yellow survey marker. The northwest corner was marked with a survey flag.

d. The compass bearing was then set to the transect angle and 10 meters was measured using the same tape and a flag was placed at the southwest corner were the PVC survey marker was to be placed.

e. Another tape measure was used to measure from the rebar to the flag (which now marked the place for the PVC survey marker) 14.14m to make sure the quadrat was square shaped rather than diamond shaped. Then the hole for the PVC was dug with a small Army/Navy compact shovel and placed with 2-3 inches showing depending on the soil and vegetation density. If we were fairly sure that the PVC pipe would not be vandalized and if the vegetation was dense in the area the PVC would be placed with 3 inches above the surface to facilitate finding it again in the summer after leaf-out.

f. The remaining corner of the quadrat was surveyed 10m using the first tape and flagged.

g. Along one edge of the tape, temporary flags marked each 1m, 3m, 5m, 7m and 9m to help identify the subquadrat. The plant species were noted on the spreadsheet. If more than one species was located at the point then all of the plant species was noted. One person stood along the one edge of the measuring tape and one person stood within the subquadrats to sight straight down and record the vegetation at each of the 25 points.

h. When the vegetation survey was complete some (only a few) pictures were taken while the flags and measuring tapes were in place. In some cases pictures of the area showing landmarks were taken to help relocation of the quadrats.

5. Recommendations for field work

It was helpful to have a person assisting the biological technician to set up the permanent quadrats. The equipement needed to set up the permanent quadrats is easily divided and carried with people. To locate the position of the proposed quadrat the transect must be surveyed with a compass to find its precise location in the field, often times this required walking up and down steep dunes and through dense vegetation stands. To carry equipement and survey along the transect with a compass, over rough terrain is very difficult. In dense stands of vegetation was helpful to have two people working to weave the measuring tape through the brush to form a straight line. I would recommend an assistant or volunteer would greatly help in the future, with the establishment of permanent quadrats.

It was found during field trials that if the diagnol was measured from the rebar to the PVC pipe it increased the accuracy of establishing the permanent quadrats. The diagnol measured 14.14m and ensured that the quadrat was square rather than diamond shaped. The volunteer or an additional person in the field stood at each of the points along the measuring tape which facilitated the vegetation survey. Temporary survey flags were placed along a second edge of the measuring tape (if they could be seen in the vegetation) so that the biological technician could orient the 25 subquadrats accurately. The technician stood at each of the 25 points (subquadrats) and identified the plant species and recorded the data on the spreadsheet. It would be easier to carry a small automatic 35mm camera instead of the park's (CCNS) manual 35mm camera.

The spreadsheet should be copied onto rite-in-the-rain paper which was purchased for the project. This would make it easy to record data even if it is raining or snowing. During the first week the quadrats were placed at Herring Cove the PVC marker was pulled out. It may become necessary to sink a plastic coated magnet next to one of the survey markers in areas where the quadrats fall in high visitor areas. Even if the PVC marker is pulled out, going to the area with a metal detector will locate the magnet and the quadrat could then be resurveyed. This was not tested in the field to date but may prove useful in the field if vandalism becomes a problem.

SCHEDULE OF TASKS BY MONTH FOR THE BROWNTAIL MOTH PROJECT

BIOLOGICAL TECHNICIAN-JANICE MINUSHKIN, CAPE COD NATIONAL SEASHORE

The following schedule of tasks to complete for the browntail moth (BTM) project was based on the sampling protocol memorandum dated January 14, 1992 (see files enclosed) and a phone conversation (Febuary 12, 1992) with Howard Ginsberg from the National Park Service Cooperative Park Studies Unit, at the University of Rhode Island. As tasks were completed the information was entered to this list. As of March 12, 1992 the project was deferred to the next fiscal year, thus the project would most likely start again in October, 1992. As the tasks were completed the day, month and 'completed' was added to this list. For the remaining tasks, the tentative month and 'need to complete' was entered. For further information and details about the tasks, methods, and sampling protocol see the files enclosed.

ESTABLISHED TRANSECTS ON USGS TOPO MAPS. COMPLETED DECEMBER (SEE TOPO MAPS IN BINDER)

PURCHASED EQUIPMENT:
1. COPIES OF DI-1'S SENT TO PROCUREMENT OFFICER CAROL DAYE IN REGION COMPLETED DECEMBER (SEE DI-1'S IN BINDER)

2. MOST OF THE EQUIPEMENT THAT WAS ORDERED ARRIVED IN DECEMBER

CONSTRUCTION OF PERMANENT QUADRAT MARKERS:

1. CUT PVC AND REBAR-COMPLETED DECEMBER

2. SURVEY MARKERS ARRIVED AND ALL ENGRAVED WITH TRANSECT CODE AND QUADRAT NUMBER. COMPLETED JANUARY, 13-15

3. FILLED PVC WITH SACCRETE AND ADDED BRASS ENGRAVED MARKERS COMPLETED JANUARY, 15-31.

4. STORED MARKERS AT WAREHOUSE WITH OTHER BTM EQUIPMENT INCLUDING CUTTERS SMALL AND LARGE, CANVAS BAGS ETC.. COMPLETED JANUARY

5. YELLOW ENGRAVED PLASTIC SURVEY MARKERS FOR 1/2" REBAR ARRIVED COMPLETED FEBUARY, 4.

SURVEYED TRANSECTS FOR VEGETATION TYPE ALONG ITS LENGTH:
NOTES WRITTEN IN THE FIELD NOTEBOOKS, TRANSECT SUMMARY AND TRANSECT DATA BASE (SEE FIELD NOTES SUMMARY MEMORADUM DATED FEB. 3, 1992 AND FIELD NOTES IN BINDER).

1. MARCONI BEACH TRANSECT-COMPLETED 12/20/91

2. RACE POINT TRANSECT-COMPLETED 1/31/92

3. HERRING COVE BEACH TRANSECT-COMPLETED 12/24/91

4. PILGRIM HEIGHTS TRANSECT-COMPLETED 1/13/92

5. PILGRIM LAKE TRANSECT (WALKED WITH HOWIE GINSBERG IN DECEMBER - 2/4/92)
COMPLETED 2/4/92

6. NORTH TRURO AIR FORCE STATION TRANSECT-COMPLETED 1/17/92

7. NEWCOMB HOLLOW BEACH TRANSECT-COMPLETED 1/21-1/22/92

8. BALLSTON BEACH TRANSECT (WALKED FROM NORTH PAMET ROAD TO OCEAN)-COMPLETED 1/22/92

9. CAHOON HOLLOW BEACH-COMPLETED 1/24/92 WITH THE EXCEPTION OF GREAT ISLAND WHICH WAS SURVEYED LATER-COMPLETED 1/30/92

10. NAUSETT LIGHT BEACH TRANSECT(SURVEYED FROM ESPANON RD. TO OCEAN)-COMPLETED 1/27/92

SENT PURCHASES INFORMATION, INCLUDED COPIES OF DI-1'S, DOCUMENT NUMBERS, AND OBJECT CLASSES TO CAROL DAYE IN REGION-COMPLETED 2/4/92 (SEE DI1'S IN BINDER)

INTERPRETED FIELD NOTEBOOK AND WROTE SUMMARY (SEE MEMORADUM DATED FEB. 3, 1992) TO SEND TO HOWARD GINSBERG-COMPLETED 2/27/92.

SOLICITED VOLUNTEERS TO HELP SET UP PERMANENT QUADRATS IN FIELD AND WROTE VOLUNTEER AGREEMENT TO SUBMIT FRANK ACKERMAN (CCNS VOLUNTEER COORDINATOR)-COMPLETED 1/27/92. (SEE VOLUNTEER SHEET IN BINDER)

RANDOM NUMBER WERE CHOSEN FOR PLACEMENT OF QUADRATS IN APPROPRIATE HABITAT. COMPLETED 2/12/92 (SEE RANDOM NUMBER SHEETS IN BINDER)

ESTABLISHED PERMANENT QUADRATS (PLACED RANDOMLY IN 'APPROPRIATE HABITAT') ALONG THE HERRING COVE TRANSECT AND RACE POINT TRANSECT. SURVEYED FOR VEGETATION AND WEB NUMBERS INFORMATION ENTERED ON SPREADSHEETS IN THE FIELD AND IN QUATTRO PRO STORED ON DISKETTE (SEE SPREADSHEETS IN BINDER) PHOTOGRAPHED SOME PERMANENT QUADRATS-COMPLETED 18 QUADRATS IN MONTH OF FEBUARY

NOTE**NOTE

AS OF MARCH 12 THE BTM PROJECT HAS BEEN DEFERRED BUT THE REMAINING SCHEDULE SHOULD BE USED AS A REFERENCE FOR FUTURE RESEARCH EFFORTS. THE SCHEDULED MEETINGS IN MARCH WITH HOWARD GINSBERG HAVE BEEN CANCELLED.

TASKS STILL REMAINING FOR BTM MONITORING PROJECT

THE TRANSECTS WITH BTM WEBS SHOULD BE RE-SURVEYED LOOKING AT A LARGER SWATH 15-20 METERS. THE SURVEY SHOULD INCLUDE GETTING ACCURATE COUNTS OF WEBS, IDENTIFYING HOW MANY WEBS THERE ARE IN THE CLUMP WITHIN THE 15-20M BOUNDARY, AND IDENTIFYING THE VEGETATION THEY ARE FOUND ON. ADDITIONAL WEB DATA IS NEEDED BECAUSE NOT MANY BTM WEBS HAVE BEEN SEEN ALONG THE 10 TRANSECTS. NEED TO COMPLETE BEFORE LEAFOUT IN SPRING

PLACEMENT OF REMAINING BTM QUADRATS, INCLUDING; THE BTM WEBS COUNTS, VEGETATION SURVEY AND TRANSECT WEB COUNTS OF 20M SWATH AS NOTED ABOVE. NEED TO COMPLETE; THE IDEAL TIME TO COMPLETE THIS WOULD BE FROM OCTOBER 1992-FEBUARY 1993

COLLECTION OF WINTER WEBS FOR LABORATORY - HOWARD GINSBERG WAS SCHEDULED COME TO CACO TO HELP SET UP RANDOMIZING PROCEDURE FOR FIELD COLLECTION OF WEBS AND TO WORK OUT A TECHNIQUE FOR GATHERING WEBS IN THE FIELD AND GATHERING WEB DATA IN THE LAB. CONTINUE TO SET UP QUADRATS AND PERFORM VEGETATION SURVEYS. CONTINUE WITH LABORATORY ANALYSIS DURING INCLEMENT WEATHER. NEED TO COMPLETE THE IDEAL TIME TO COMPLETE THIS WOULD BE FROM OCTOBER, 1992-MARCH, 1993

CONTINUE PLACING PERMANENT QUADRATS. WORK IN LAB. WORK WITH DATA. MAP QUADRAT SITES AND INPUT DATA TO COMPUTER. NEED TO COMPLETE CONTINUE THROUGH APRIL

TREE CANOPY INFORMATION GATHERED FROM FOREST HABITATS (FIELD METHODS STILL NEED TO BE WORKED OUT). CONTINUE LAB ANALYSIS AND PLACEMENT OF PERMANANT QUADRATS IN FORESTED AREAS. NEED TO COMPLETE DURING MAY, JUNE, JULY, AUGUST

DEFOLIATION STUDY (FIELD METHODS STILL NEED TO BE WORKED OUT) SHOULD TAKE PLACE AFTER SPRING FEEDING AND BEFORE FALL FEEDING OF ADULTS. NEED TO COMPLETE JULY-BEGINNING OF AUGUST

WINTER WEB AND VEGETATION RE-SURVEY. ADD QUADRATS IF NECESSARY. NEED TO COMPLETE; START OCTOBER, 1993

3 Febuary 1992

MEMORANDUM

To: Resource Management Specialist, Cape Cod National Seashore
Chief Scientist, NARO
Invertebrate Ecologist, National Park Service

From: Biological Technician, Cape Cod National Seashore

Re: Status of Browntail Moth Project

This is an update of the status of the browntail moth project on Cape Cod based on the work I have accomplished since the revised sampling protocol (see MEMORANDUM, 7, January 1992). I set up a tentative calender of tasks needed to complete the project based on the revised protocol memorandum. All of the equipment has been ordered. The permanent survey markers are constructed and ready to place in the field. Appropriate habitat for browntail moth has been delineated along each transect using orienteering methods in the field based on transect lines drawn on topographic maps (see Revised Protocol Memorandum for more details). The goal of walking the ten transects was to identify 'appropriate habitat' for browntail moth areas to establish permanent quadrats and look for browntail moth webs along the ten transects. I defined 'appropriate habitat' based on the presence of browntail moth found in plant species as noted in various studies found in the Resource Mangement files at Cape Cod National Seashore. As I walked each transect I identified habitats, noted habitat changes and habitat widths (by pacing). The habitat was recorded by identifying major vegetation types and land use at each 20m length (set of 13 paces). Privately owned land was not surveyed. All field notes are recorded in BTM notebooks. I have identified 'appropriate habitat' as mixed pine ,oak forest/ oak forest/ pine, scrub oak/ bayberry, brush/ Rosa sp., brush areas/ beach plum, scrub oak. Other habitats included in the survey but were not identified as 'appropriate habitats' were pine, heathlands/ beach grass/ grass, freshwater marsh, ditches/ locust forest/ sand/ privately owned land.

The following is based on my field notes and gives a synopsis of the transects as I walked them, idenifying vegetation changes or land use type and giving the length in meters. (See map)

North to South along Cape Cod

transect # 1 Herring Cove Beach (HCB)

The total length of the transect is 1700m. The length of transect surveyed was 1400m. The remaining 300m to the east of Bradford Street is privately owned land. There is 760m of

appropriate habitat and another 400m of open area with occasional Rosa sp. clumps.

Summary of field notes- BRADFORD STREET -> WEST TO SHANK PAINTER BAR

FROM BRADFORD STREET TO PROVINCETOWN HARBOR IS PRIVATE LAND 300M

HOTEL	40M
BAYBERRY/DUNES	300M
ROSA SP./OAKS	60M
BLUEBERRY/OAKS	80M
LOCUST FOREST	40M
ROSA SP./BAYBERRY	280M
SAND	100M
BAYBERRY CLUMP	20M
GRASS	60M
ROSA SP.	20M
GRASS W/ A CLUMP OF ROSA SP.	400M

transect # 2 Race Point Beach (RPB)

The total length of the transect is 3500m . I paced 340m of appropriate habitat. And an additional 300m was paced from the Government Housing area south to the private camp ground of appropriate habitat. South of Route 6 is private land for 780m and not surveyed. Browntail moth webs new and old were seen in the area but not on transect walked.

Summary of field notes- FROM ROUTE 6 -> NORTH TO OCEAN

FROM ROUTE 6 ->SOUTH TO BAY IS PRIVATE LAND	780M
PRIVATE CAMPGROUND	360M
PINE/OAK	240M
ROAD	20M
PINE/SAND	40M
PINE/BOG	80M
SAND DUNE	40M
PINE/OAK/SAND	60M
PINE	360M
PINE/OAK	40M
PINE	60M
SAND	60M
PINE	80M
DUNE	80M

transect # 3 Pilgrim Lake (PGL)

The total length of the transect is 1500m of which only a small area is appropriate for quadrats approxiamately 60m. Browntail moth webs were seen in the vicinity of the transect. I will go out and re-walk this transect soon.

Summary of field notes:

transect # 4 Pilgrim Heights (PGH)

The total length of the transect is 2090m of which 1590m was surveyed. There is 1040m of appropriate habitat surveyed. There is an additional 500m of appropriate habitat not surveyed it will require cutting ones way through. Old browntail moth webs were seen in the area but not on the transect.

Summary of field notes: FROM CAPE COD BAY TO PILGRIM SPRING BIKE TRAIL

PRIVATE LAND, HOTELS AND HOUSES	100M
OPEN AREA/BRUSH	60M
SCRUB OAK/BAYBERRY	140M
PINE	120M
6A PINE	120M
SCRUB OAK/BRUSH	60M
PINE/BAYBERRY	160M
PINE	80M
PINE/SCRUB OAK	80M
PINE/SCRUB OAK/BAYBERRY	680M
BIKE TRAIL NORTH IS VERY THICK CATBRIER, BRUSH, BAYBERRY, PROBABLY BEACH PLUM BUT REQUIRES CUTTING	500M

transect # 5 North Truro Air Force Station (AFS)

The total length of the transect is 3300m of which 1560m was surveyed. The remaining area is privately owned south of Highland Road to Cape Cod Bay. Of the length surveyed all of the area is appropriate habitat. The actual transect as placed on the map was not surveyed, I used a man-made path that goes in the same general direction as the transect, the area is very dense and would require cutting ones way through for most of its length.

Summary of field notes: FROM HIGHLAND RD. -> NORTH TO OCEAN

PRIVATE LAND NOT SURVEYED FROM BAY TO ROUTE 6	1100M
PRIVATE LAND NOT SURVERYED FROM RT 6 TO HIGHLAND ROAD	660M
PINE/OAK	1220M
OAK	300M
BAYBERRY/BRUSH	40M

transect # 6 Ballston Beach (BAB)

The total length of the transect is 4900m of which only 600m of NPS land was surveyed and provides appropriate habitat. The remaining length of the transect is privately owned land.

Summary of field notes: FROM NORTH PAMET ROAD TO OCEAN

FROM NORTH PAMET ROAD TO BAY IS PRIVATE LAND	4300M
PINE/BAYBERRY/OAK	380M
BAYBERRY/SCRUB OAK	180M
BEACH GRASS/ OCCASIONAL ROSA SP. CLUMPS	40M

transect # 7 Newcomb Hollow Beach (NHB)

The total length of the transect is 5760m. 3010m of the transect would be considered appropriate habitat. The remaining length is private land and freshwater marsh areas.

Summary of field notes: FROM CAPE COD BAY -> OCEAN

DUNE/BAYBERRY/BRUSH	400M
GRASS/SCATTERED BRUSH	40M
FRESHWATER MARSH/BAYBERRY	240M
FRESHWATER MARSH	120M
BAYBERRY/SCRUB OAK	40M
HEATH/PINE/SCRUB OAK	140M
PINE/SCRUB OAK	300M
SCRUB OAK/MARSH	120M
FRESHWATER MARSH	100M
SCRUB OAK/BRUSH/MARSH	60M
PINE/SCRUB OAK	240M
BAYBERRY/SCRUB OAK	40M
FRESHWATER MARSH	210M
BAYBERRY/SCRUB OAK	40M
PINE OAK	2032M
PRIVATE LAND	660M
PINE OAK	1020M
BAYBERRY/PRIVATE	40M
OAK/PINE	40M
PRIVATE AREA AROUND POND	
FROM NE HORSELEECH TO OCEAN	
OAK/BRUSH/CATBRIER	140M
PINE/OAK	80M
DUNE/BRUSH/SCRUB OAK/BEACH PLUM	20M

transect # 8 Cahoon Hollow Beach (CHB)

The total length of transect is 4,700m. From the Ocean to Old Kings Highway measures 2,760m which is all appropriate habitat. From Old Kings Highway to the bay is private land for 1,700m.

We should consider evaluating Great Island as an additional transect. Browntail moth webs from this year and last year where seen on oaks, beach plum, and bayberrry as David and I walked along the most northerly coast from east to west along the vegetation line. (The coastline was walked from the extreme east point along shore to the point where the transect touches Great Island.) I would suggest randomizing numbers for quadrats along this shore for placement of upslope quadrats. In this way we will be sure to have quadrats in known browntail moth habitat, in the most southernly area in which browntails have been seen on this survey. There are places to gather webs for laboratory analysis.

Summary of field notes: FROM OCEAN -> OLD KINGS HIGHWAY

BEACH GRASS/DUNES	40M
PINE/SCRUB OAK	480M
PINE/OAK	2160M
PINE/SCRUB OAK	80M
PRIVATE LAND TO BAY	1000M

GREAT ISLAND- COAST WALKED FROM EAST -> WEST

PINE/SCRUB OAK/BEACH PLUM	100M
PINE/GRASS	80M
PINE/SCRUB OAK/BAYBERRY	40M
EROSION AREA	120M
BAYBERRY/PINE	60M
PINE	60M
PINE/BAYBERRY	40M
PINE	40M
BAYBERRY/PINE/ROSA SP.	60M
PINE/BAYBERRY/SCRUB OAK/GRASS	180M
PINE/GRASS	20M
SCRUB OAK/OPEN	20M
OPEN	40M
BAYBERRY/SCRUB OAK/BEACH PLUM/ROSA	60M
PINE/GRASS	60M
BAYBERRY/SCRUB OAK	180M
GRASS	20M
BAYBERRY/PINE/BEACH PLUM	100M
OPEN	20M
BAYBERRY/ROSA/PINE/GRASS	240M
DUNE/GRASS	100M

transect # 9 Marconi Beach (MCB)

The total length of this transect measures 3850m. From Route 6 southwest is private land and has been surveyed and is inappropriate habitat anyway. Lieutenant Island was not surveyed and is all privately owned land. From Route 6 to the ocean 800m is appropriate habitat and the remaining 800m is not appropriate habitat.

Summary of field notes: FROM OCEAN -> ROUTE 6

DUNES	100M
BEACH GRASS/BAYBERRY	120M
PINE/BEACH GRASS	200M
PINE	100M
HEATHLANDS	80M
PINE	100M
CEDAR/HUCKLEBERRY	20M
PINE/SCRUB OAK	680M
ROUTE 6 TO BAY IS ESSENTIALLY PRIVATE	1140M

transect # 10 Nausett Light Beach (NLB)

The total length of the transect measures 4300m and of that 1480m is appropriate habitat. Most of this transect is privately owned land.

Summary of field notes: FROM ESPANON RD. -> OCEAN

FROM BAY TO ESPANON RD IS PRIVATE LAND	2920M
PINE/OAK	1480M
PRIVATE LAND ALONG ROAD	160M
SCRUB OAK/BRUSH ALONG PRIVATE LAND BUT POBABLY NOT ON PRIVATE LAND, DIFFICULT TO GET TO.	40M

Along all of the transects not many browntail moth webs were seen. In areas of known infestation I walked surrounding area and found browntail moth webs. For example along the Race Point Beach Transect 330 degrees I did not see any browntail moth webs but along an angle of 303 degrees I came upon more appropriate habitat and old browntail moth webs. We should probably still plan on setting up some quadrats in known browntail moth infestation areas and collection of webs from these areas to analyze at the laboratory. During the next month permanent quadrats will be placed randomly in appropriate habitat along each transect. I will also be doing the vegetation survey of each quadrat as they are constructed. I have been in contact with volunteers to assist me with this next phase of the project. I expect this will require at least five weeks to complete.

If you have any questions or comments please call me at (508) 349-3785.

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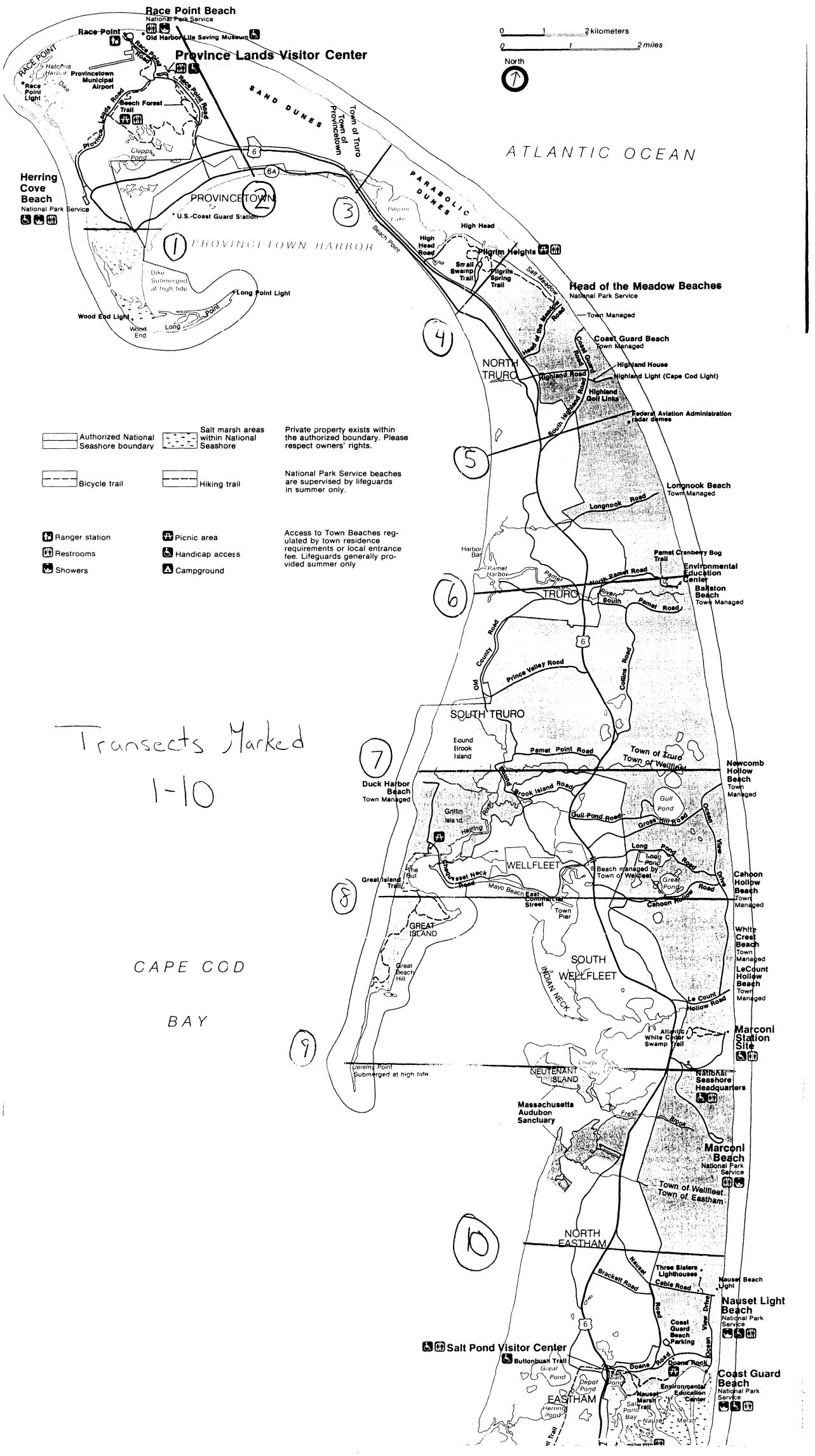

Transects Marked 1-10